DOCUMENT RESUME

ED 446 472 HE 033 226

TITLE	A Time To Sow: Report from the Task Force on Learning Technologies.
INSTITUTION	Council of Ontario Universities, Toronto.
REPORT NO	COU-671
ISBN	ISBN-0-88799-345-1
PUB DATE	2000-03-00
NOTE	27p.
PUB TYPE	Opinion Papers (120)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Computers; Curriculum Development; Educational Planning; Educational Technology; Educational Trends; Enrollment Trends; Foreign Countries; Higher Education; Instruction; Internet; *Strategic Planning; *Technology; Technology Education; Universities
IDENTIFIERS	Council of Ontario Universities

ABSTRACT

Information technology and telecommunications advances affect universities in addition to business. Ontario universities need to address the importance of incorporating learning technologies (LTs) into their teaching. The Task Force on Learning Technologies was established to address Ontario universities' need to utilize learning technologies and to guide their implementation in the Ontario higher education system. Many workplaces in Ontario, Canada require development of advanced technological skills, and continued education and training. Opportunities exist for appropriate uses of information and telecommunications technologies in the realms of teaching and learning, particularly with regard to Ontario's university system. The task force recommends that each institution develop specific strategies for learning technology (LT) at the institutional and system level; that there is a need for a more supportive environment for faculty and students who use learning technologies; and that there is a need for significant investment in learning technologies by government, private sector, and institutions, facilitated by strategic partnerships and collaborations. It is recommended that the COU articulate a system-wide approach to LTs; and that each institution indicate their level of commitment to LTs via their strategic plans and policies. (HB)

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ED 446 472

A TIME TO SOW

REPORT FROM THE TASK FORCE ON LEARNING TECHNOLOGIES

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March 2000

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COU № 671

ISBN: 0-88799-345-1

HE033 226

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FOREWORD

The Task Force was initiated by the Council of Ontario Universities (COU) and its affiliate the Office for Partnerships for Advanced Skills (OPAS) at a time when advances in information and telecommunications technologies are generating great changes, which carry important implications for teaching and learning. The Task Force's mandate was to examine opportunities for appropriate uses of these technologies as well as barriers to their effective use, and to make recommendations that will bring about more effective utilization of learning technologies in the context of a host of exigencies that universities face. In addition to university leaders, its membership included senior members from the Communications and Information Technology industry and organizations as well as senior government representatives. This initiative demonstrated the value of working in partnership to address major issues. A list of members can be found in the report's Appendix.

EXECUTIVE SUMMARY

> "A social, economic and cultural revolution is now transforming the world. A new game is starting, and the older rules no longer apply. It is imperative that Canada move quickly to meet the challenges and seize the opportunity of this new age."
>
> *Information Highway Advisory Council, Final Report 1997*

The rapid emergence of information and telecommunications technologies is transforming the way organizations are conducting business. Universities are certainly no exception. They are accustomed to exploiting new technologies quickly, for research purposes, but less so for teaching. In the U.S., U.K. and other jurisdictions, large investments are being made to accelerate the adoption of learning technologies. By comparison, Ontario universities have been slower to address this challenge.

This report challenges Ontario universities to recognize the urgency of addressing the potential of learning technologies (LTs) and their implications. Given the increasing competition from both traditional and non-traditional sources, the organization, funding and management of LTs require immediate attention. The report also challenges the Ontario government and private sector representatives to recognize the importance of supporting our institutions in this endeavour.

For the purposes of this report, learning technologies are defined as:

> those information and communications technology tools that provide increased opportunities for interaction with learning materials and among learners, as designed and guided by university faculty. Used effectively, they enhance the quality of student learning and can improve access by allowing students to pursue learning opportunities in their own time and place.

An initiative of the Council of Ontario Universities (COU), the Task Force on Learning Technologies was established in October 1999 to examine opportunities for the appropriate utilization of learning technologies, to identify impediments to their effective use, and to make recommendations to guide the approach to LTs at Ontario universities. Drawn from universities, industry and government, our members have pooled their knowledge, experience and perspective of these issues. While the report is not based on original research, its various assertions and statements are documented in existing research reports and practice.

Our starting point was the recognition of the opportunities for the enhancement of learning provided by new communications technologies as part of the evolution to a more "learner-centred" focus in education. Our notion is of universities with clear strategic plans that offer flexible learning alternatives to their students and that make the best possible use of their most valuable resource, their faculty members. We also believe that LTs offer solutions to a number of current concerns about quality, service and student support.

Up to this point, most of the work in the field of learning technologies has been driven by pioneering faculty and administrators who see their potential to enhance teaching and learning. The need for such enhancement is made more important by emerging factors such as the burgeoning demand for quality education in an increasingly knowledge-based and global society; the well-documented increases in demand for university places that Ontario will be facing over the next decade; recognition of the opportunities for independent and interactive learning provided by new technologies; and the increasing comfort with and expectations for learning technologies held by today's youth.

Recommendations are grouped into three major categories, detailed and documented below:

- The need for strategic planning specific to learning technologies at both the institutional and system levels.
- The need for a more supportive environment for faculty and students who use learning technologies.
- The need for significant investment in learning technologies by government, by the private sector and by the institutions themselves, facilitated wherever possible by strategic partnerships and collaborations.

While we live in a world of constant change, this is a particularly crucial time for Ontario universities. They are on the cusp of a generation change as the demographics of student demand and faculty supply will result in a huge increase in the former and a high turnover in the latter. The window of opportunity is small. The decisions we take in the next two to three years will effectively define our institutions for the next decade or two. It is crucial that we make the right decisions about the allocation of resources. We believe that a more strategic and more effectively supported application of communications technologies to teaching and learning is a vital factor in the long-term effectiveness and reputation of Ontario universities.

We eagerly look forward to responses to this report.

We cannot overstate the importance or the urgency of coming to grips with the many facets of this challenge.

A TIME TO SOW

REPORT FROM THE TASK FORCE ON LEARNING TECHNOLOGIES

INTRODUCTION

"New technologies such as the World Wide Web and multimedia have the potential to widen access to new learners, increase flexibility for 'traditional' students and improve the quality of teaching… [but]… technology needs to be embedded within a wider strategy for teaching and learning."

A.W. Bates, Managing Technological Change, Jossey-Bass 2000

These are among the observations from the opening pages of a recent publication by A.W. Bates, a Canadian expert in learning technologies. The author also notes that the introduction of new technologies is costly, requires an infrastructure and support for users if it is to be successful, and generally involves significant other changes in the organization.

These views are highly congruent with those reached by this Task Force. Our main additional point would be the sense of urgency and opportunity created by a set of emerging factors and key issues that we will outline.

On virtually every university campus across Canada, some faculty members are making significant commitments to enhancing teaching and learning through the use of learning technologies. Others believe that the current set of new technologies represents the greatest advance since the invention of the printing press. Still others remain deeply skeptical. The result is an uncertainty that hobbles progress.

The Task Force on Learning Technologies was initiated by the Council of Ontario Universities (COU) with the mandate of examining the field of learning technologies (LTs) to:

- consider opportunities for the appropriate roles of LTs at universities;
- identify constraints to their effective use; and
- recommend steps to promote the strategic and effective utilization of LTs by universities in the context of existing and emerging realities.

Task Force members include senior representatives of universities, relevant industries and government. A list of Task Force members is provided in the Appendix.

No original research was undertaken; instead the Task Force relied on a review of available information and its collective perspectives, experience and knowledge.

The title of our report, *A Time to Sow,* from Ecclesiastes, reflects the urgency and opportunity of this endeavour.

The Task Force took as its starting point the recognition of the opportunities for the enhancement of learning provided by new communications technologies.

A primary rationale for advocating a more active and strategic approach to learning technologies within the universities is the shift to a more learner-centred focus in education. Efficient learning systems are of vital importance for competitiveness in the knowledge-based society, and it is essential that we constantly seek to advance the learning environment at our institutions. Other important factors include the emergence of new expectations from students who tend to be increasingly comfortable with learning technologies, as well as the accelerating development of better and cheaper communications networks.

It is our collective conviction that the strategic harnessing of these new technologies will ultimately not only help to produce graduates who are better suited to the many and diverse demands of today's society but also help to enhance their learning experience.

At the outset, it is important to clarify what we mean by learning technologies and emphasize that it is their *strategic use*, rather than the technologies themselves, that is of primary importance:

> Learning technologies are those information and communications technology tools that provide increased opportunities for interaction with learning materials and other learners, as designed and guided by university faculty. Used effectively, they enhance the quality of student learning and can improve access by allowing students to pursue learning opportunities in their own time and place.

The use of technology in university teaching and learning is not new. The printing press made the printed word widely available. Chalk and blackboards, overhead projectors, photocopying machines, movie projectors, VCRs, radio, TV and a host of other technologies have been widely used for many years.

Recently, a new generation of technologies has been developed based on personal computers and associated hardware and software, especially the Internet. To date, these new learning technologies have been used primarily by a small number of pioneering faculty at virtually all universities in Ontario. Their use has been applied to both classroom learning and distributed learning, which refers to learning where the instructor and learner(s) may be geographically separated.

The number of faculty using these new LTs is now increasing. In fact in 1998-99, there were well over 26,000 full-course equivalent registrations in distributed learning offerings – many of these from on-campus students. In many cases, the escalating use of learning technologies results from a growing familiarity with technology that faculty have acquired from their research work. Some universities have begun to recognize the importance of faculty efforts by providing them with special support. Nonetheless, few institutions have developed well-formulated strategic plans to provide a campus-wide framework for guiding the appropriate and efficient use of LTs to enhance both classroom learning and distributed learning.

Fewer still have recognized that these technologies, especially those that build on the Internet, have the potential to radically alter the context within which universities offer their services to society and, therefore, the very nature of the institutions. So-called "disruptive" technologies, such as the PC and the Internet, tend to have the greatest impact by changing the rules of the game, especially through altering in a fundamental way the available options for meeting the needs of individuals and society as a whole. Changes to how learning is provided, what that learning includes, and the roles of institutions such as universities in meeting those changing needs are just elements in a larger shift that these new technologies are generating.

There are many reasons for the lack of strategic planning. One major reason is the lingering uncertainty of many senior administrators and faculty about the value of LTs generally and about the relative merits of competing tools. Some may even remain skeptical about the eventual impact of LTs, viewing their increased use as a slippery slope – a step toward a weakened and substandard educational system. Another is the very limited resources and flexibility available to universities after more than a decade of constrained funding.

Despite the skepticism of some, the Task Force sees clear evidence of the potential of LTs to support and provide improved access to high-quality learning experiences for students. Whether used to enhance classroom teaching or for distributed learning, many faculty have applied learning technologies to the teaching process with undeniable success.

> While most pioneering faculty have pursued LTs simply to enhance their own teaching and research, learning how to use them effectively has come to have strategic significance for the entire institution.

EMERGING FACTORS

At present, universities in Ontario are facing a number of developments that will require strategic responses. The Task Force has reviewed these and finds that LTs may contribute to addressing these new pressures. Among these emerging factors are the following:

A. HIGH-QUALITY EDUCATION FOR THE KNOWLEDGE-BASED SOCIETY

Ontario has clearly become a knowledge-based society in which most new jobs require advanced education, problem-solving ability and continued learning to master new workplace demands. Distinguished from previous eras by the greater intensity of its use of knowledge, the new society comes with new demands driven by technological innovations that generate new forms of enterprise and new ways of doing business.

A knowledge-based society creates both the opportunity for Ontario to be the best jurisdiction in North America to live, work, invest and raise a family (see *A Road Map to Prosperity*) and the need for our graduates to be at least comparable to those in competing jurisdictions.

Ontario and Canada compete with jurisdictions around the world for new enterprise. Since companies increasingly base their decisions on where to locate or expand their business on the ready supply of qualified workers, the quality of our graduates will be a critical factor.

To succeed in what has become a highly competitive global market, Ontario requires working people who are well educated and who will maintain leading-edge skills to keep pace with changes in skill demands.

In an increasingly complex, open, knowledge-based society, well-educated citizens are also a necessity for a healthy community. Moreover, learning has long been associated with equality of opportunity and the chance for each individual to make the most of his or her potential.

Evidence is accumulating that suggests LTs can assist in enhancing the quality of teaching, by offering different and more flexible approaches to learning, as well as providing access to an extraordinary range of learning simulations that include complex chemical models or three-dimensional holograms of rare specimens; distant historical archives or online art galleries; and live satellite transmissions of weather patterns.

Learning technologies also offer other opportunities to improve quality. For example, instructors can share expertise, making each other's strengths available to their students. This process of drawing on strength could operate within a department or more broadly.

At the same time, LTs pose the threat of diluted quality by enabling out-of-province providers to bring both less expensive low-quality education and very high-quality education programs to Ontario, creating a major challenge for Ontario universities.

B. CAPACITY ISSUES

The following factors have influenced the growing demand for university education:

- **Double cohort** – Due to the restructuring of secondary education in Ontario, implemented in September 1999, there will be two groups of students graduating from high school mainly in the spring of 2003, one graduating from the old five-year structure and the other graduating from the new four-year structure. Many graduates of both will seek university admission in the same year, resulting in an increased demand.

- **Demographic changes** – The arrival of the "echo boom" means that Ontario's population of 18- to 24-year olds is forecast to grow by 18% between 1998 and 2010. The university participation rates of this age cohort increased from 13.6% in 1985-86 to 22% in 1997-98 and are projected to continue to grow.

- **Rising participation rates** – Participation rates in Ontario's university age cohort increased to 22% in 1997-98, in part due to the greater likelihood that the children of university graduates are likely to attend university. The rate is forecast to increase to approximately 25% by 2010.

- **Rising job demands** – Employers are increasingly requiring university graduation for those they recruit. A majority of new jobs now require a postsecondary education. As a result more people are seeking university enrolment than in the past.

- **Lifelong learning** – A growing proportion of the workforce is now involved in knowledge work. Their knowledge forms the basis of their work. The specific skills that they utilize change with changes in technology, with the development of new information, new forms of business and new ways of doing business. Consequently, they need to continue to acquire and upgrade skills throughout their careers to keep pace with these changes. Increasingly these workers, and their employers, look to universities to provide this skill upgrading. As a result, adult learners are expected to make up half the population of those in higher education by the early part of this century.

- **Increasing appetite for knowledge** – A general increase in the appetite for knowledge has two sources. The first is the growing individual desire for a better life that is often realized through higher education. The second is a quest for equality of opportunity that historically has been satisfied in Canada through public education. Together, these result in a rising expectation for higher education.

The combined effects of these factors are expected to increase the demand for full-time university enrolment by up to 40% during this decade; a significant increase in part-time enrolment is also expected.

There are also some significant supply issues that will have an impact on capacity.

- **Faculty supply** – In addition to the factors that are generating increased student demand, there are also major concerns about the supply of faculty and their ability to cope with the increased demand. There is a large cohort of university faculty approaching retirement age. Since Ontario universities grew rapidly in the 1960s and early 1970s, a great deal of new recruitment occurred in this period, often involving faculty who were then in their early thirties. Now, 30 or more years later, these faculty members are reaching retirement age. The much lower levels of recruitment in recent years means that there are far fewer younger faculty available to teach the growing numbers of university students and lifelong learners. By the year 2010, between 11,000 and 13,000 new faculty will be needed to offset retirements, meet the increased enrolment demand, and lower the student-to-faculty ratio from the current level of 21 to 1. This ratio is already 21% higher in Ontario than in the rest of Canada. Further, the Canadian ratio is higher than those found in American jurisdictions.

- **Existing infrastructure** – Many university buildings were built several decades ago and lack the necessary infrastructure to support new technologies. The high cost of "retrofitting" these aging buildings with the necessary infrastructure creates another type of supply limitation that impacts on capacity. Ontario's SuperBuild program will assist in addressing this problem.

C. SEIZING OPPORTUNITY AND MEETING EXPECTATIONS

New technologies and continuing innovations are making available new ways to deal with challenges such as *access* and *quality*. Just as the Gutenberg Press made knowledge widely available through the printed word, contemporary advances are creating new opportunities for the convergence of technology, telecommunications and learning content.

These include advances such as:

- the growing availability of ever-faster access to the Internet;
- the increasing efficiency of networks and decreasing cost of transmission;
- the continuing increase in basic computer processing and storage capacity;
- improvements in areas such as content compression and video streaming;
- broad access to increasingly affordable personal computers and software;
- development of new technologies arising from the convergence of computers, broadcast and telecommunications; and
- deregulation and increased competition in the telecommunications market.

All of these advances make learning feasible without the requirement of having teacher and learner in the same place. In short, they add to the range and flexibility in approaches to learning and offer more opportunities for independent learning.

A second dimension of this opportunity factor is that a growing proportion of learners is computer literate. Many young people can combine this literacy with a familiarity with dynamic learning that traces back to their experience with educational television and a facility with computer games.

Young learners, consequently, are not only more amenable to technology-based interactivity, but they are also more likely to expect technology-mediated learning as part of a more diverse set of learning approaches and modes of delivery.

A final opportunity factor is Ontario's SuperBuild program that has begun to provide resources that will help universities make improvements in infrastructure. A total of $742 million has been provided to postsecondary institutions in 1999-2000.

SUMMARY

Learning technologies add flexibility to students' learning and can enhance the teaching process. They can also help address emerging issues, including an escalating demand for high-quality education, growing capacity requirements and evolving opportunities in the university system.

Learning technologies have advanced to a new stage and offer increased flexibility and the opportunity to enhance learning. A set of emerging factors may increase the importance of this potential.

The use of LTs may be particularly relevant for people in the work force who require continued learning in particular skill areas and for those who learn best using approaches other than traditional classroom teaching.

The Task Force believes that learning technologies:

- are being used by a growing number of faculty to enhance their teaching, both in the classroom and for distributed learning;
- facilitate independent learning by allowing students to assume more responsibility for their own learning;
- provide new opportunities for linking research and learning by providing the opportunity for students to experience the process and product of research;
- can enhance student learning through the use of visual tools, such as simulations, that allow learners to see and experience learning material more vividly (for example, graphic representations of physiological systems, works of art, historical sites);
- can contribute to higher quality education via improved teaching aids;
- are accessible to young people, who tend to have familiarity with new technologies and are open to their use in learning;
- may assist in addressing some of the emerging pressures facing universities, especially access and capacity;
- can help improve access by allowing faculty to teach large classes more effectively;
- can facilitate sharing of lectures, including sharing among universities;
- are particularly relevant for adults requiring continued learning directed at continued employability, where the facilitation of "anytime, anyplace" learning is a particularly important consideration; and
- may be helpful in serving the needs of graduates who seek continued learning in areas where Ontario universities face increased competition from other institutions (some of which may not provide quality comparable to that of universities).

KEY ISSUES

The Task Force identified three important issues that must be addressed if we are to see the strategic and effective advancement of LTs at the universities. Following an outline on each of these issues, exemplary solutions are noted. The key issues are:

- need for strategic planning and envisioning the future of learning;
- need to provide support for faculty and students using LTs; and
- need for adequate and strategic investment in LTs.

In seeking responses to address these issues, our starting point was a review of what has worked successfully to date as well as evidence of what has not been helpful. Recognizing that an initiative that was successful in one context may not necessarily be a useful approach in another, our approach here is not to promote any specific solution, rather to provide examples of responses that have succeeded in particular settings and to offer them as potential models.

A. THE NEED: STRATEGIC PLANNING AND ENVISIONING THE FUTURE OF LEARNING

On most campuses, early efforts with LTs have been centered on pioneering faculty who have used a variety of tools and approaches to enhance learning in their classes, whether delivered on-campus or through distance education. Although the application of new technologies is not catching on as fast nor as widely or cost effectively as some had expected or feared, a majority of faculty, students and administrators are rapidly embracing LTs. (There were well over 26,000 full-course registrations in distributed learning offerings in 1998-99.) In part, this reflects the greater use of technology in administration and in research activities at the universities.

More recently, network-centric technologies represent a major technological shift that may provide fundamentally new ways of facilitating learning. As yet, there has been insufficient study of how these LTs are changing learning. Universities can play a key role in both researching the impact of these LTs as well as harnessing them to their best purpose.

An important starting point for the appropriate implementation of LTs is the need for true leadership and vision to guide implementation. Senior administrators and faculty leaders must understand how fundamental these LTs can be in terms of revolutionizing the learning environment for universities. And they must ensure that a clear vision and strategic plan are developed to guide initiatives in this area.

As A.W. Bates points out, "The widespread use of new technologies in an organization does constitute a major cultural change [and] for such change to be successful, leadership of the highest quality is required."

Clearly, technology has had an important impact on research and administration. The use of technologies for learning should be considered in relation to these other activities. Not only must careful planning be done around physically networking the campus internally and externally, but each faculty and department must also begin to think about how their course offerings are best served by these new technologies. The challenges include determining:

- Which courses are best offered in some technology-mediated learning (TML) form?
- Who will implement the necessary changes in the curriculum?
- What will the impact be on the learner?
- How will these changes be made?
- Who will pay for these changes?
- Who will provide technical support?
- What models of learning are involved in these new LTs?
- What instructional/pedagogical support is there for faculty to guide their efforts?
- What can research tell us, on an ongoing basis, about the effectiveness of LTs?

Strategic planning must also take place in order to provide clear direction and commitment on physical infrastructure. Concerns include:

- Networks that do not provide adequate bandwidth, stability and security required for widespread access and use;
- Lack of consistent technology standards among universities and colleges, in terms of applications and media used;
- Disparate distance learning pilots, currently underway, that lack co-ordination;
- On-campus and off-campus access currently available through relatively low-speed connections and congested networks;
- Insufficient multimedia content available for distance education applications; and
- Faculty members' skills limited to content development only.

There is another critical reason for careful strategic planning around the increasing use of LTs. Their application is seldom value-neutral, and the widespread adoption of new approaches to learning can have significant impact on the culture of the institution, often in unintended ways. Their introduction, therefore, must be guided by careful course design and responsive faculty and student support. Well-designed pilot projects and careful monitoring of results are important components of an effective approach to new technologies.

In the new era of Internet-based distributed learning, many institutions will find themselves facing severe competitive challenges even in their traditional markets. Strategic thinking and planning around the impact and potential of learning technologies is essential.

Successful Responses to Strategic Planning

Evidence suggests that the successful integration of LTs into the learning environment builds on a strong vision of the strategic objectives of the institution and on the planning of all aspects of the implementation of LTs. Moreover, a clear strategic plan will allow universities to respond much more quickly to opportunities as they arise. It is important to emphasize that in the university context any planning process is, to a certain extent, iterative, that the process must balance bottom-up initiatives and the development of a top-down framework, and that ultimate success builds on stakeholder involvement, including that of students.

A STRATEGIC PLANNING PROCESS

Phase 1: Strategic Vision and Goals	▪ Review expectations of the future direction of higher education. ▪ Identify roles that can be appropriately/usefully filled by LTs (for example, the development of flexible learning in different formats based on the needs and preferences of learners). ▪ Define goals appropriate to the institution in the new context.
Phase 2: Alternative Strategies and Resource Requirements	▪ Define options to achieve the stated vision and goals, including resource requirements. ▪ Select preferred options.
Phase 3: Organization, Management and Administration Strategies	▪ Determine optimum organization structures (for example, creation of a centre for faculty support). ▪ Clarify roles and responsibilities for development, implementation and ongoing support. ▪ Identify required resources and build partnerships to achieve them.
Phase 4: Implementation Plan	▪ Develop specific plans, including definition of schedules and milestones, selection of appropriate standards, acquisition of equipment, software and authoring tools, etc. ▪ Allocate resources. ▪ Establish timelines.
Phase 5: Evaluation and Reformulation	▪ Establish measurable outcomes wherever possible. ▪ Evaluate effectiveness of implementation against these measures. ▪ Establish ongoing learning from results, reformulating plans on a continuing basis. ▪ Report results for accountability and to share learning with others.

B. THE NEED: PROVIDING A SUPPORTIVE ENVIRONMENT

FOR FACULTY:

A relatively small group of faculty has provided much of the impetus for the first stage of adoption of LTs. Many other professors are reluctant to use these tools in their teaching. This reluctance is based on a number of concerns that include:

- Lack of time to develop the materials.
- Time committed to such a project takes time away from other aspects of scholarship such as research and publication, which are better recognized and rewarded.
- Lack of incentives to spend the necessary time on tasks such as reviewing the best practices from their own university and elsewhere.
- Lack of technical skills to use the appropriate technologies.
- Limited access to tools (both hardware and software), a development platform and software resources that facilitate course development, and a network environment that ensures student access to the program and related materials.
- Concern with the protection of intellectual property in cyberspace.
- Concern that online courses may undermine faculty roles in teaching (for example, "canned" courses will be administered by groups of teaching assistants or sessional lecturers).
- Concern that the lack of face-to-face contact in the classroom may undermine the quality of the learning.
- Lack of support and incentive for understanding available options, acquiring needed skills, or considering choices among different combinations of technology, pedagogy, content and educational purpose.
- Stress associated with keeping up with the field of learning technology and information technology, and coping with increasing information overload relating both to their field and to the growth in instructional options.
- Perception of loss of control arising from a lack of understanding of how the addition of LTs affect instruction.
- Concerns about plagiarism and security lapses in relation to grading and essays.

All of these create disincentives for faculty.

FOR STUDENTS:

The use of LTs in universities also raises a number of significant issues for students. These include:

- The potential for simply transferring current "knowledge transmission" models of teaching and learning to these new media resulting in a "passive" student learning style with a "talking head" learning environment. This represents the potential for an impoverished learning environment for students.
- The potential isolation of students from meaningful face-to-face interaction and exchange.

- The lack of access, or variability in access to appropriate hardware and software. Despite significant growth in computer ownership and usage overall, the growth has occurred to a greater extent within some income levels, demographic groups, and geographical areas, than in others. This is commonly known as the "digital divide" and it is widening.
- The lack of adequate bandwidth for some individuals.
- The lack of support for students in their adoption and use of LTs on campus for their learning.
- Concerns that LTs may disrupt and in some cases threaten the sense of community in a university that is essential to the identity of the university and to the larger education and socialization of undergraduates.
- Uneven access to sufficient bandwidth for increasingly sophisticated applications.
- Concerns about the impact of LTs on student evaluation.

A more supportive environment for users is clearly required if we are to encourage the use of learning technologies.

Successful Responses to a Supportive Environment

For Faculty:

A number of campuses have adopted strategies that provide a more supportive environment for faculty using LTs. These strategies include establishing Educational Technology Centres to support the new learning environment. These centres usually offer technical support, instructional design assistance and a means of sharing instructional resources, as well as facilitating collaboration. Some universities pursue policies that provide hardware and software required for the purposes of technology-mediated learning (TML). Some offer release time for faculty to acquire the new skills needed to use LTs successfully and, in some cases, students are hired on a part-time basis to support faculty in their development of new learning materials and their greater use of LTs.

Joint committees of administration and faculty have begun to consider how efforts can be appropriately rewarded in tenure and promotion decisions, as well as discussions of intellectual property rights and sharing of increased resources that are generated from online initiatives by faculty.

Additional types of support include the joint acquisition of authoring tools and related software. An initial province-wide site licence has been arranged by OPAS and COU and provides a cost-effective model. The recent proposal of the Ontario government to connect Ontario universities to each other and to CA*net 3, the national advanced research and education backbone, will constitute an important response to the need for infrastructure between institutions. Through CA*net 3 and the network envisaged by this initiative, students and faculty at Ontario universities will have a dedicated, very high bandwidth connection to the global research and education community and its collective repository of learning resources.

The Institute on Learning Technologies for Postsecondary Instructors, organized by OPAS, TVOntario and IBM, represents an effective initial effort that provides support for LT users.

For Students:

Successful approaches to supporting students begin with the adoption of models of learning that focus on interactivity. Examples include the use of LTs such as e-mail and CHAT groups to enhance interaction with instructors and fellow learners; the use of learner-centred activities such as simulations, self-testing and group projects; and a mix of on-campus, face-to-face learning activities with LT-mediated activities.

Other useful supports include access to technology and tools, along with help desks to provide necessary technical support. Low student-to-instructor ratios enable all students to have meaningful interaction with instructors. Systematic institutional research identifies the approaches that work best in facilitating learning.

C. THE NEED: INVESTMENT OF RESOURCES

It is clear that systematic use of LTs by universities will require a significant infusion of new resources. The resources are required for a number of purposes:

- One-time start-up costs and periodic costs of putting in place an appropriate infrastructure, including ensuring that classrooms and laboratories are equipped to use modern learning technologies. This includes appropriate wiring, PC plug-in capacity and Internet access.
- Resources for the ongoing maintenance costs of learning via new technologies, including network upgrading, curriculum developments and faculty acquisition of new skills.
- Access to appropriate software and related tools is also required. For example, authoring tools such as WebCT can provide time-saving and effort-saving approaches to TML if already available.
- Technical and related support is needed to facilitate the use of LTs in effective ways.

The marshalling of adequate resources will require the combined efforts of several sources, including:

- governments – federal and provincial;
- private donors;
- industry contributions and corporate partnerships;
- existing organizations such as the Office for Learning Technologies, Contact North, Tele-learning; and
- institutions (re-direction of institutional resources).

Three realities stand out as crucial:

1. After more than a decade of constrained public funding, universities are not in a position to secure all of the required resources themselves;
2. Universities must develop commitments to LT and allocate and redirect resources to meet LT needs as part of any program of obtaining external resources.
3. We have a rare window of opportunity available to us, briefly; it is formed by the confluence of three factors:
   - a new level of relevant technologies and ability to harness them;
   - a significant turnover in faculty allowing for new, more varied approaches to teaching and learning; and
   - the need for early action created by strong competition from other jurisdictions

Successful Responses to Investment of Resources

Successful investment of resources has occurred at several institutions and in broad jurisdictions. While there does not appear to be any single formula for success, there are some common components:

- an investment of additional new resources, provided over a period of time, with a degree of "front-end" weighting to cover the one-time costs of equipment and other capital layouts;
- strategic partnerships and collaborations to maximize resources; and
- strategic allocation plans that include regular budgetary items for learning technologies.

It seems clear that a meaningful advancement of the use of LTs will require significant resources, strategic partnerships and shared initiatives wherever possible.

SUMMARY

Three issues have been outlined and some examples of how these might be successfully addressed have been provided. These solutions begin with a vision of the future of advanced education and a strong strategic plan. The plan can guide policies and practices that offer a more supportive environment for faculty who use LTs to enhance their teaching and to support students who want to use new approaches to their learning. Examples of approaches used successfully are offered as potential models of how to proceed in this area.

CONCLUSIONS

The Task Force has concluded that the strategic application of learning technologies in teaching and learning will give Ontario universities, their students and their graduates a desired advantage in this knowledge-based society. While there are considerable challenges associated with the effective application of these existing and emerging technologies, the Task Force cannot overstate the importance and urgency of coming to grips with these challenges.

Evidence from other jurisdictions indicates that many universities and university consortia have invested and are investing massively in LTs. These developments pose a serious threat to Ontario universities, notably in recruitment and retention of both faculty and students. In addition, corporate partners are becoming involved as investors in consortia in other jurisdictions and may not be able or willing to participate in competing arrangements in Ontario. It is therefore urgent that Ontario universities respond immediately to this challenge, learning from American experiences and directing new resources to technological change to be positioned to face the competition strategically and collaboratively. We have no time to lose.

The ability to deliver quality education that can be benchmarked with that available in competing jurisdictions is particularly important at this point in the evolution of Ontario's universities. Student demand for education is about to reach a 30-year high, with predictions indicating increases of up to 90,000 new students over the next decade. The first surge is just around the corner, with secondary school reforms doubling the number of high school graduates. At its peak in 2003-2004, it is estimated that the double cohort phenomenon will result in 33,500 additional students seeking opportunities at Ontario universities. This will occur at a time when faculty will be retiring in record numbers, a trend that will be mirrored in universities across North America.

New technologies can not only significantly contribute to our universities' ability to deliver the quality education essential for success in our knowledge economy, but will also play key roles in the long-term development of a responsive, dynamic university community in the millennium.

The following steps are central to the successful interpretation of learning technologies into the mainstream of teaching and learning:

- the development of strategic plans at both the system-wide and institutional level to provide the platform for guiding process;
- the removal of existing disincentives and barriers, and the creation of a supportive environment for users; and
- investment in new resources that are allocated for optimum utilization.

Continuing efforts must be dedicated to exploring and discovering more about the burgeoning field of communication technologies. There is much to be gained by making the exploration of their potential applications in teaching and learning an urgent priority.

This report offers an initial assessment of the needs and opportunities for technology-mediated learning. Recommendations on how to proceed follow.

RECOMMENDATIONS

This review of the appropriate role of learning technologies has led the Task Force to the view that LTs can enhance teaching and learning given appropriate planning and support.

The Task Force offers three general recommendations for urgent implementation:

A. that strategic plans be developed to guide the use of learning technologies;
B. that a supportive environment for faculty members and students using LTs be nurtured; and
C. that an adequate investment in learning technologies be made, including new resources, the use of strategic partnerships and the strategic allocation of resources for successfully advancing the use of LTs.

Each of these three main recommendations encompasses a number of specific recommendations that are directed at one or more sectors.

Specific Recommendations	Prime Responsibility

A. STRATEGIC PLANS

A primary step toward the effective use of learning technologies is the development of a strategic plan based on a vision of the future of higher education.

The Task Force recommends that:

1. Each institution develop a strategic plan to guide its policies and practices related to LTs. These plans may be relatively centralized or decentralized to faculties or departments as appropriate for the institution. Consultation with current and future learners should be part of the planning process.	**University**
2. A system-wide view of the appropriate role of LTs at universities be developed for the Ontario university system, led by COU, to provide a basis for articulating our broad approach for use of LTs and our need for new resources. This report may serve as a first step in that process.	**COU**
3. Individual institutions as part of their strategic plan indicate their degree of commitment to LTs and the policies and practices they will put in place to achieve their goals. Institutions may vary considerably in the degree of their orientation to LTs and, accordingly, may require different plans and levels of resources to achieve their LT goals.	**University**

Specific Recommendations	Prime Responsibility
B. SUPPORTIVE ENVIRONMENT	
In light of the disincentives inherent in current reward structures and in limited support available to faculty and students who pursue the use of learning technologies, the Task Force recommends:	
For Faculty:	
1. Universities recognize faculty accomplishments in the field of learning technologies in their rewards systems. Research in the field of LTs should be considered scholarly work while teaching enhancements achieved through LTs should be considered contributions to teaching.	**University**
2. Establish LTs support centres – either centralized or decentralized – to faculties or other units. These centres should include expertise in instructional design, pedagogical practices and evaluation, among other areas. They should develop and support templates that facilitate the creation of technology-mediated learning, and provide in-house training, "train the trainer" and pilot projects.	**University**
3. Provide up-to-date tools and equipment to assess the efficacy of technology-mediated learning and provide a factual basis for improving it.	**University**
4. Put in place ongoing practices to ensure the availability of up-to-date tools and equipment for the continuing support of TML.	**University**
For Students:	
1. Ensure that students seeking to learn via LTs receive support through access to equipment, software, related services and a help service.	**University** **Government** **Industry**
2. With the support of adequate public funding, reduce the faculty-student ratio to more competitive levels in order to ensure adequate interaction and support	**Government** **University**

Specific Recommendations	Prime Responsibility

C. INVESTMENT OF RESOURCES

Adequate Investment of New Resources

Well-conceived strategic plans, partnerships and collaborations can help achieve cost efficiencies. But an investment of new resources is required if Ontario is to build on its heritage as a leader in distributed learning. The Task Force views the current confluence of the availability of a new generation of technologies and the emergence of a new set of demands on higher education as presenting an opportunity and a critical crossroad. With adequate resources to fuel an intelligent plan, it will be possible to carry out research on LTs, implement effective plans and meet many of the emerging demands. Without these resources, Ontario will fall behind in the crucial area of developing our human capital. The implications of such a failure will be serious and sustained.

The Task Force recommends that:

1. Governments – federal and provincial – provide a significant new investment to support the more effective use of learning technologies in Ontario's universities. Funding programs that can be integrated offer greater impact. — **Government**

   - The Government of Ontario introduce a program fund on the lines of the ORDCF, providing $50 million annually over a five-year period for advancing the strategic use of learning technologies. These funds would be used for acquiring needed infrastructure: wiring classrooms and laboratories, providing technical support to faculty and student users, compiling and sharing templates, authoring tools, etc. — **Government**
   - The federal government introduce a program fund, to provide matching investments for telecommunications, information infrastructure and related matters. — **Government**
   - Both of these funds should be phased in to ensure the ability to acquire basic services and equipment, including the required wiring of classrooms and laboratories. — **Government**

2. Funds be allocated to universities based on the coherence and impact of their strategic plans and level of commitment to technology-mediated learning. Institutional commitments should reflect the expert advice that a commitment equal to 2% of operating budget is needed for a serious advancement of LTs. — **Government University**

Specific Recommendations	Prime Responsibility
3. Universities assist in advancing LTs by providing release time for a number of faculty to acquire the needed LTs skills each year.	**Government** **Industry**
4. Government, industry and universities support the establishment of a "centre of excellence" to compile and provide expertise, carry out research and evaluation, share tools and course templates.	**Government** **Industry** **University**
Partnerships and Collaboration	
1. An awards program to recognize outstanding achievements in the field of learning technologies be developed. The program should provide recognition to individual faculty members and to their institutions. The awards could be structured to support LTs, for example, by providing cash, hardware and/or software.	**Government** **Industry** **OPAS**
2. Build on existing relevant organizations and industry-university-government partnerships, such as the Office for Learning Technologies, CANARIE, Contact North and the Office for Partnerships for Advanced Skills (OPAS) wherever possible, to increase effective support of learning technologies while minimizing additional bureaucracy.	**University** **Industry** **Government** **OPAS**
3. Establish a modest "centre for pursuing TML" to provide shared support, content and templates to advance the effective use of LTs that builds on existing organizations and earlier initiatives such as those carried out by OPAS, TVO and industry partners.	**University** **Industry** **OPAS**
4. Undertake a review of the digital library concept with a view to promoting the development of library resources for undergraduate programs in all faculties.	**COU**
5. Appropriate collaborations among institutions and between institutions, government, industry and communities be pursued wherever appropriate.	**Industry** **University** **Government**
Strategic Allocations	
1. Universities, while determining their level of commitment to learning technologies based on their strategic plan, allocate a minimum of 2% of their operating budgets to support learning technologies.	**University** **COU/OPAS**
2. Pursue provincial site licences and other joint endeavors as a means of obtaining greatest value for investment.	**University/** **COU/OPAS**

APPENDIX

MEMBERS OF THE TASK FORCE ON LEARNING TECHNOLOGIES

Chair: Prof. David Johnston, President, University of Waterloo

Industry Representatives

- Dr. Andrew Bjerring
  President and CEO, CANARIE Inc.
- Mr. Tony Ciceretto
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  Vice-President, SGI
- Mr. Gaylen Duncan
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- Dr. Ross Paul
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Government and Other Representatives

- Mr. David Kennedy
  Director, Information and Communications, Technologies Branch, Ministry of Energy, Science and Technology and Ministry of Economic Development and Trade
- Mr. James Mackay
  Director Universities Branch, Ministry of Training, Colleges and Universities
- Dr. Norm Shulman
  Executive Director, OPAS